KEE HING CHEUNG KEE CO., LTD.

DLFTZ CHANG HING KEE

INT'L INDUSTRY & TRADE CO., LTD.

Micro Wind Generator

500W – 20kW

Content

Part I General Introduction

The traditional fossil fuel such as coal, natural gas, and oil etc., causing pollution in the generating process, will be used up in the coming years. Energy resource shortage makes people turn to the renewable energy. One of them is wind. Wind turbine converts the kinetic energy from wind power to electricity, which is avoided heavy investments in coal plants, new gas generators, or thermal units. And indubitable, there is no pollution.

KHCK engaged in the development and application of wind turbine systems under 20kW, and have accumulated a wealth of experience in new energy project design and construction.

KHCK micro wind turbine with start wind speed down to 2.5m/s, weighs only 1/5 of the conventional ones and is also strong enough to overcome Typhoons, Max. wind speed 40m/s. low noise; high utilization rate; both on and off grid system; control and off load system integrated; easy installation etc. Thin design and cute figure decorate your house and farm perfectly.

How to choose a Wind Turbine

- **Step1** Consider the area in which you live. As wind turbines are mounted on large metal structures, they would not necessarily be a good idea to be installed within an urban area or a suburban area where you don't have a lot of land. You should have at least an acre or more. Some turbines have rotors that are one meter or less if space is at a premium, but you don't get as much output as with a larger turbine.
- **Step2** Determine the wind speed in your area. To let a wind turbine to function properly and to produce enough output make a difference on your energy bill, you need at least an average of 10 mph wind speed. You can find that information at the Department of Energy. If you live in a hilly or mountainous area, you might want to collect your own wind data. You need to find that the place you wish to install your wind turbine and tower is too sheltered to work properly.
- **Step3** Figure out how many kilowatt-hours of electricity your house needs per year. For example, many homes consume about 9400 kWh. If this is the case, you would need a turbine that is rated at least 5 to 15 kWh to help meet this demand. We will help you choose the turbine that best suits your needs.
- **Step4** Inform your utility company that you plan on installing a wind turbine. You won't have to change the wiring within the house, but the connection to the house must be done by a utility company or someone authorized by the utility company to do so.
- **Step5** Purchase your turbine directly from the company or through a turbine dealer. Most turbines come with towers that are possible for the homeowner to install without assistance. If you require assistance, we are delighted to do this for you.

We list our main wind turbines below.

KHCK-Your Ideal Partner!

500W Micro Wind Generator

The Model KF-2.7-500 Wind Turbine has the great advantages of high efficiency and low rated wind speed. It introduces several patented technologies and uses some special materials.

The controller adopts the integrated design which consists of the controlling, inverting and load-diverting parts. It fulfills the functions of charging and protection for over charging / discharging, over-loading and short circuit, also supplies a diversion load. The controller outputs sine wave and has a spare interface for solar energy. Without especial fixation, the controller for 500W could be connected to the solar panel within 200W. The Yaw Shaft has the equipment of electric slip ring inside which can ensure the free running of generator without cable twisting.

Due to the modularization-design, KF-2.7-500 Wind Turbine is free for maintenance and easy for installation. It can be installed without welding, concrete or cranes but manual work. Even a tyro can handle it swiftly.

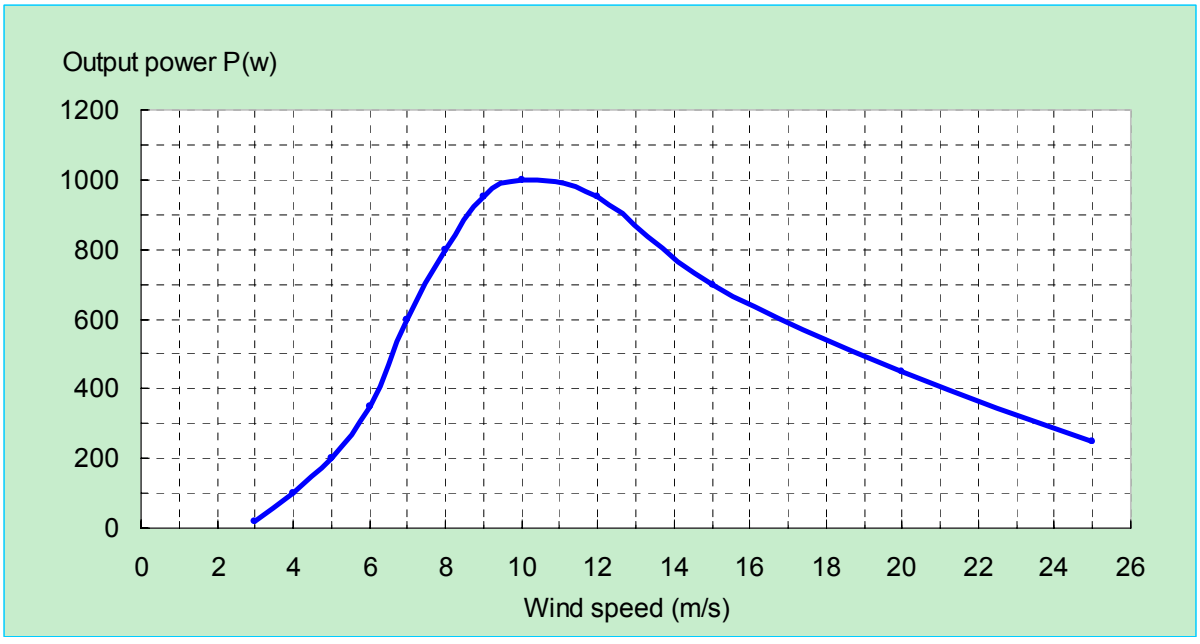
Application: It can drive color TV, refrigerator (≤130L), pump (≤500W). Well used in: Telecommunications Station/ TV Transfer Station/ Residential Monitoring Station (military, hydrology, and observatory)/ Water-pumping.

Technical Specification:

No.	Item	Data
1	Rated power(W)	500
2	Maximum output power（W）	1000
3	Charging voltage (V)	DC 24V
4	Blade quantity	3
5	Blade material	GRP (glass fiber reinforced plastic)
6	Blade diameter（m）	2.7
7	Start-up wind speed (m/s)	3

No.	Item	Data
8	**Rated wind speed (m/s)**	**7**
9	Rated rotating rate (r/min)	600
10	Wind energy utilizing ratio (Cp)	0.48
11	Generator output	Single-phase frequency conversion AC
12	Output AC frequency (Hz)	0~300
13	Rated charging current (A)	15
14	The maximum charging current (in a short time)(A)	25
15	Generator efficiency	>0.78
16	Guy tower diameter(mm) (Diameter*Wall thickness*Height per segment)	Φ76*3*2000
17	Wireless tower diameter(mm)	Ø 210×Ø 67×8000 (3pcs)
18	**Guy tower height(m)**	**6**
19	**Generator weight (kg)**	**6.5**
20	Battery 12V 150Ah/200Ah	2pcs

Output curve- KF-2.7-500 Wind Turbine



1000W Micro Wind Generator

KF-3.1-1000 Wind Turbine has the great advantages of high efficiency and low rated wind speed. It introduces several patented technologies and uses some special materials.

The off-grid controller adopts the integrated design which consists of the controlling, inverting and load-diverting parts. It fulfills the functions of charging and protection for over charging/discharging, over-loading and short circuit, also supplies a diversion load. The controller outputs sine wave and has a spare interface for solar energy. Without especial fixation, the controller for 1000W could be connected to the solar panel within 400W. The on-grid controller can connect wind power to electrical grid.

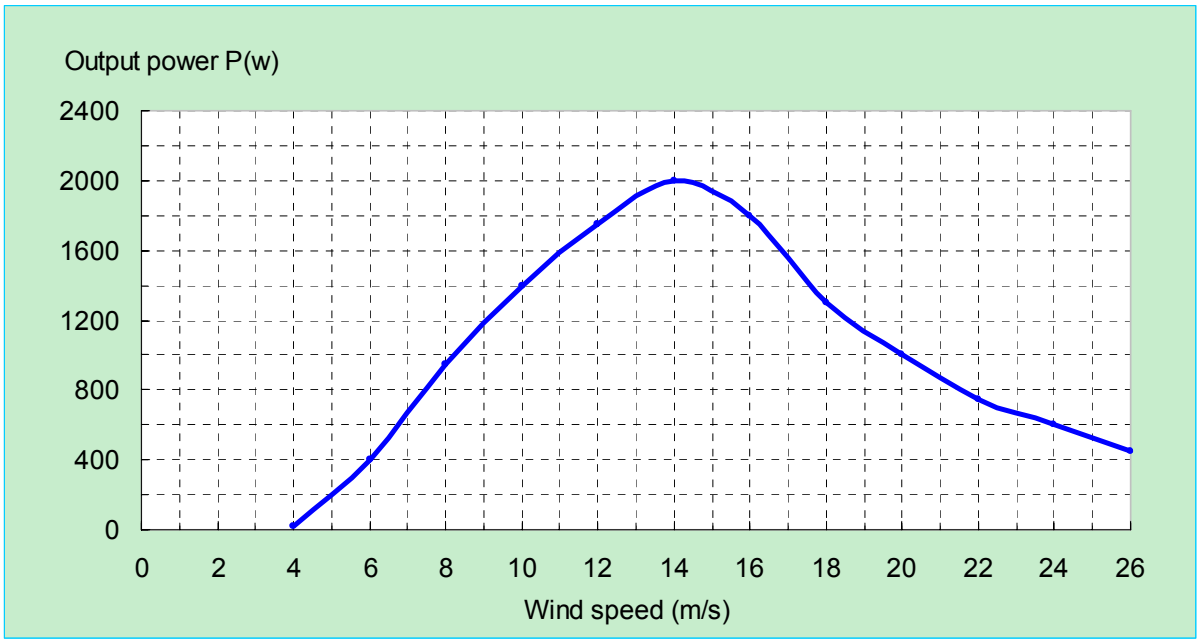
The Yaw Shaft has the equipment of electric slip ring inside which can ensure the free running of generator without cable twisting. Due to the modularization-design, KF-3.1-1000 Wind Turbine is free for maintenance and easy for installation. It can be installed only by the manual work, without welding, concrete or cranes. Even a tyro can handle it easily and swiftly.

Technical Specification:

No.	Item	Data
1	Rated power(W)	1000
2	Maximum output power（W）	2000
3	Charging voltage (V)	DC 60V
4	Blade quantity	3
5	Blade material	GRP
6	Blade diameter（m）	3.1
7	Start-up wind speed (m/s)	3
8	Rated wind speed (m/s)	9

No.	Item	Data
9	Rated rotating rate (r/min)	500
10	Wind energy utilizing ratio (Cp)	0.45
11	Generator output	Single-phase frequency conversion AC
12	Output AC frequency (Hz)	0~400
13	Rated charging current (A)	15
14	The maximum charging current (in a short time)(A)	30
15	Generator efficiency	>0.8
16	Guy tower diameter(mm) (Diameter*Wall thickness*Height per segment)	Φ89X3.5×2000
17	Wireless tower diameter(mm)	Ø 210×Ø 67×8000 (3pcs)
18	**Tower height(m)**	8
19	**Generator weight (kg)**	15
20	Battery 12V 150Ah/200Ah	5pcs

Output curve- KF-3.1-1000 Wind Turbine



2000W Micro Wind Generator

KF-3.8-2000 Wind Turbine has the great advantages of high efficiency and low rated wind speed. It introduces several patented technologies and uses some special materials.

The off-grid controller adopts the integrated design which consists of the controlling, inverting and load-diverting parts. It fulfills the functions of charging and protection for over charging / discharging, over-loading and short circuit, also supplies a load diversion. The controller outputs sine wave and has a spare interface for solar energy. Without especial fixation, the controller for 2000W could be connected to the solar panel within 700W.

The on-grid controller can connect wind power to electrical grid.

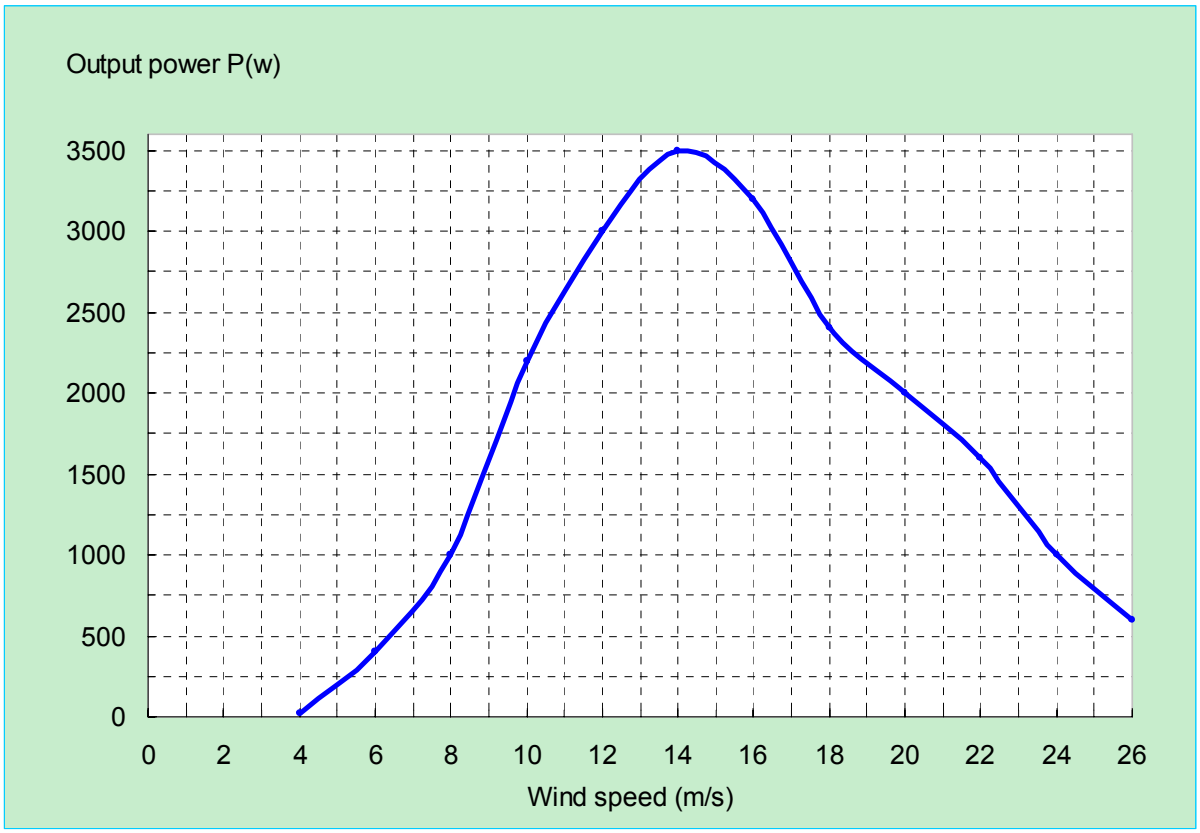
The Yaw Shaft has the equipment of electric slip ring inside which can ensure the free running of generator without cable twisting. Due to the modularization-design, KF-3.8-2000 Wind Turbine is free for maintenance and easy for installation. It can be installed only by the manual work, without welding, concrete or cranes. Even a tyro can handle it easily and swiftly.

Technical Specification:

No.	Item	Data
1	Rated power(W)	2000
2	Maximum output power（W）	3200
3	Charging voltage (V)	DC 120V
4	Blade quantity	3
5	Blade material	GRP
6	Blade diameter（m）	3.8
7	**Start-up wind speed (m/s)**	**3**
8	**Rated wind speed (m/s)**	**9**

No.	Item	Data
9	Rated rotating rate (r/min)	450
10	Wind energy utilizing ratio (Cp)	0.45
11	Generator output	Single-phase frequency conversion AC
12	Output AC frequency (Hz)	0~370
13	Rated charging current (A)	15
14	The maximum charging current (in a short time)(A)	28
15	Generator efficiency	>0.8
16	Guy tower diameter(mm) (Diameter*Wall thickness*Height per segment)	Φ118X4×2000
17	Wireless tower diameter(mm)	Ø 291×Ø97×10000 (2pcs)
18	**Tower height(m)**	**10**
19	**Generator weight (kg)**	**25**
20	Battery 12V 150Ah/200Ah	10pcs

Output curve- KF-3.8-2000 Wind Turbine



3000W Micro Wind Generator

KF-4.6-3000 Wind Turbine has the great advantages of high efficiency and low rated wind speed. It introduces several patented technologies and uses some special materials.

The off-grid controller adopts the integrated design which consists of the controlling, inverting and load-diverting parts. It fulfills the functions of charging and protection for over charging/discharging, over-loading and short circuit, also supplies a diversion load. The controller outputs sine wave and has a spare interface for solar energy. Without especial fixation, the controller for 3000W could be connected to the solar panel within 1500W.

The on-grid controller can connect wind power to electrical grid.

The Yaw Shaft has the equipment of electric slip ring inside which can ensure the free running of generator without cable twisting.

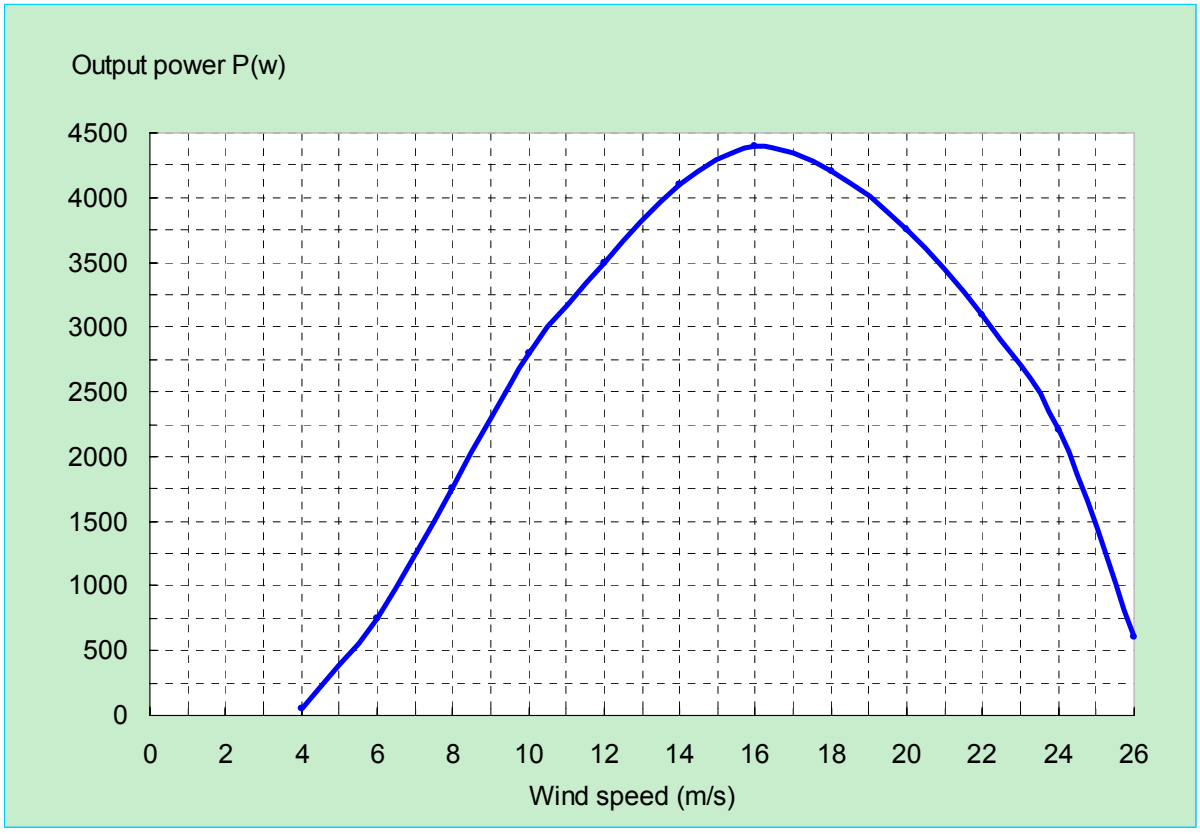
Due to the modularization-design, KF-4.6-3000 Wind Turbine is free for maintenance and easy for installation. It can be installed only by the manual work, without welding, concrete or cranes. Even a tyro can handle it easily and swiftly.

Technical Specification:

No.	Item	Data
1	Rated power(W)	3000
2	Maximum output power（W）	4500
3	Charging voltage (V)	DC 180V
4	Blade quantity	3
5	Blade material	GRP
6	Blade diameter（m）	Ø4.8

No.	Item	Data
7	**Start-up wind speed (m/s)**	**2.5**
8	**Rated wind speed (m/s)**	**10**
9	Rated rotating rate (r/min)	400
10	Wind energy utilizing ratio (Cp)	0.4
11	Generator output	Single-phase frequency conversion AC
12	Output AC frequency (Hz)	0~360
13	Rated charging current (A)	16
14	The maximum charging current (in a short time)(A)	28
15	Generator efficiency	>0.8
16	Guy tower diameter(mm) (Diameter*Wall thickness*Height per segment)	Ø140×4×3000 (4pcs)
17	Wireless tower diameter(mm)	Ø 397×Ø137×12000 (3pcs)
18	**Tower height(m)**	**12m**
19	**Generator weight (kg)**	**60kg**
20	Battery 12V 150Ah/200Ah	15pcs

Output curve- KF-4.6-3000 Wind Turbine



5000W Micro Wind Generator

Streamlined three-bladed glass fiber reinforced blades have the advantages of great intensity, fatigue resistance and high efficiency. The generator characterizes its high efficiency and good low-speed-performance.

The off-grid controller adopts the integrated design which consists of the controlling, inverting and load-diverting parts. It fulfills the functions of charging and protection for over charging / discharging, over-loading and short circuit, also supplies a diversion load. The controller outputs sine wave and has a spare interface for solar energy. Without especial fixation, the controller for 5000W could be connected to the solar panel within 2000W.

The on-grid controller can connect wind power to electrical grid.

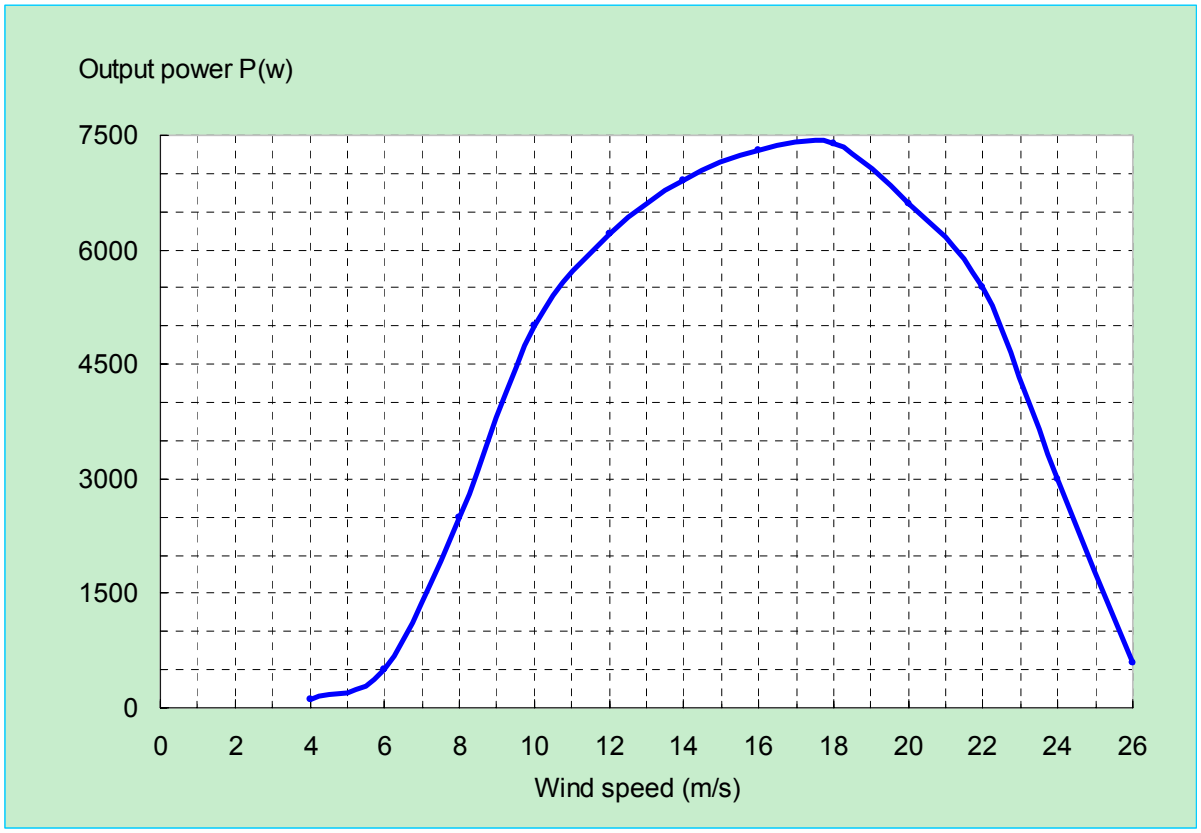
The speed regulating system works automatically according to wind speed. The Yaw Shaft has the equipment of electric slip ring inside which can ensure the free running of generator without cable twisting. The whole system is easy to install and convenient to maintain. Controlling, inverting and discharging are integrated.

Technical Specification:

No.	Item	Data
1	Rated power(W)	5000
2	Maximum output power（W）	7500
3	Charging voltage (V)	DC 240V
4	Blade quantity	3
5	Blade material	GRP
6	Blade diameter（m）	Ø6.4
7	**Start-up wind speed (m/s)**	**2.5**

No.	Item	Data
8	**Rated wind speed (m/s)**	**10**
9	Rated rotating rate (r/min)	240
10	Wind energy utilizing ratio (Cp)	0.4
11	Generator output	Single-phase frequency conversion AC
12	Output AC frequency (Hz)	0~360
13	Rated charging current (A)	20
14	The maximum charging current (in a short time)(A)	32
15	Generator efficiency	>0.8
16	Guy tower diameter(mm) (Diameter*Wall thickness*Height per segment)	Φ220×6×3000 (4pcs)
17	Wireless tower diameter(mm)	Φ495×Φ185×12000（2pcs）
18	**Tower height(m)**	**12m**
19	**Generator weight (kg)**	**147kg**
20	Battery 12V 150Ah/200Ah	20pcs

Output curve-KF-6.4- 5000W



10kW Micro Wind Generator

KF-8.0-10000 Wind Turbine has the great advantages of high efficiency and low rated wind speed. It introduces several patented technologies and uses some special materials.

The off-grid controller adopts the integrated design which consists of the controlling, inverting and load-diverting parts. It fulfills the functions of charging and protection for over charging/discharging, over-loading and short circuit, also supplies a diversion load. The controller outputs sine wave and has a spare interface for solar energy. Without especial fixation, the controller for 10000W could be connected to the solar panel within 3500W.

The on-grid controller can connect wind power to electrical grid.

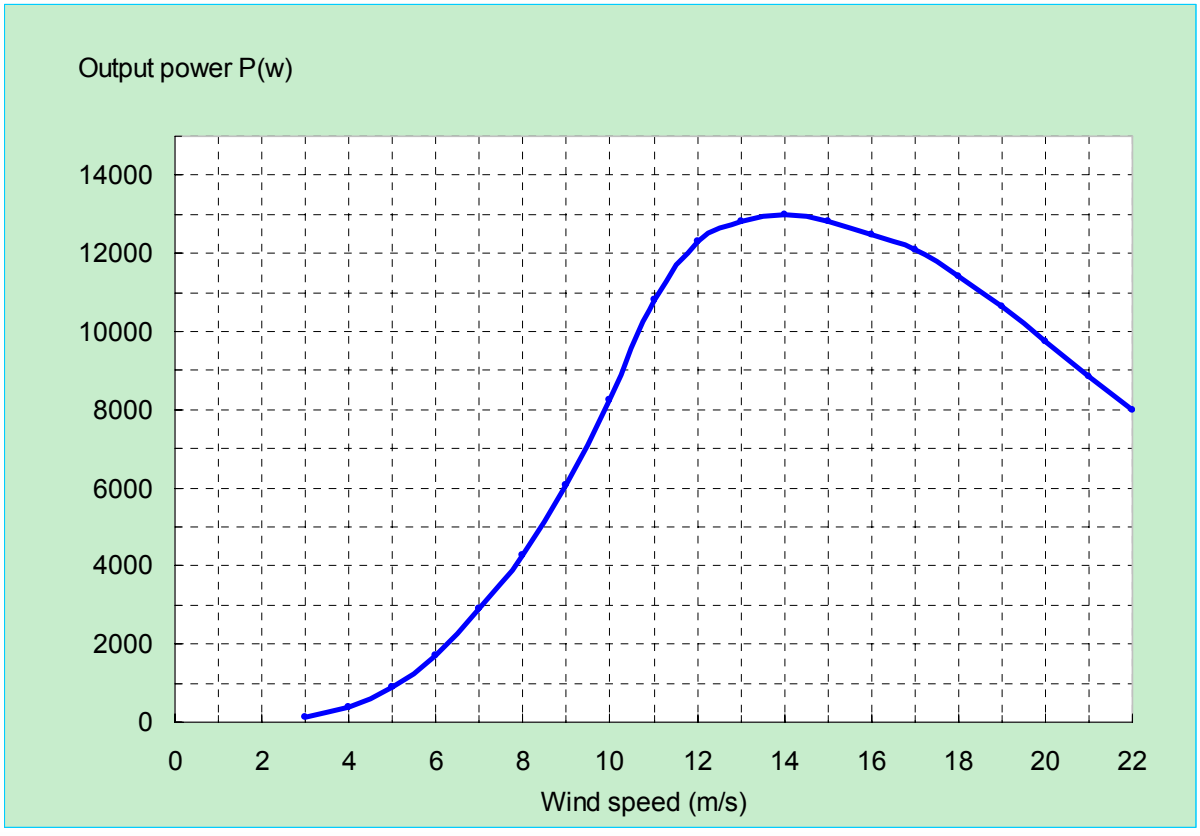
The Yaw Shaft has the equipment of electric slip ring inside which can ensure the free running of generator without cable twisting. Due to the modularization-design, KF-8.0-10000 Wind Turbine is free for maintenance and easy for installation.

Technical Specification:

No.	Item	Data
1	Rated power(W)	10000
2	Maximum output power（W）	15000
3	Charging voltage (V)	DC 300V
4	Blade quantity	3
5	Blade material	GRP
6	Blade diameter（m）	Ø8.0
7	Start-up wind speed (m/s)	3
8	Rated wind speed (m/s)	10

No.	Item	Data
9	Rated rotating rate (r/min)	180
10	Wind energy utilizing ratio (Cp)	0.42
11	Generator output	Three-phase frequency conversion AC
12	Output AC frequency (Hz)	0~360
13	Rated charging current (A)	33
14	The maximum charging current (in a short time)(A)	65
15	Generator efficiency	>0.8
16	Guy tower diameter(mm) (Diameter*Wall thickness*Height per segment)	Ø360×8×3000 (4pcs)
17	Wireless tower diameter(mm)	Ø 530×Ø 370×12000 (3pcs)
18	**Tower height(m)**	**12m**
19	**Generator weight (kg)**	**150kg**
20	Battery 12V 150Ah/200Ah	25pcs

Output curve - KF-8.0-10000 Wind Turbine



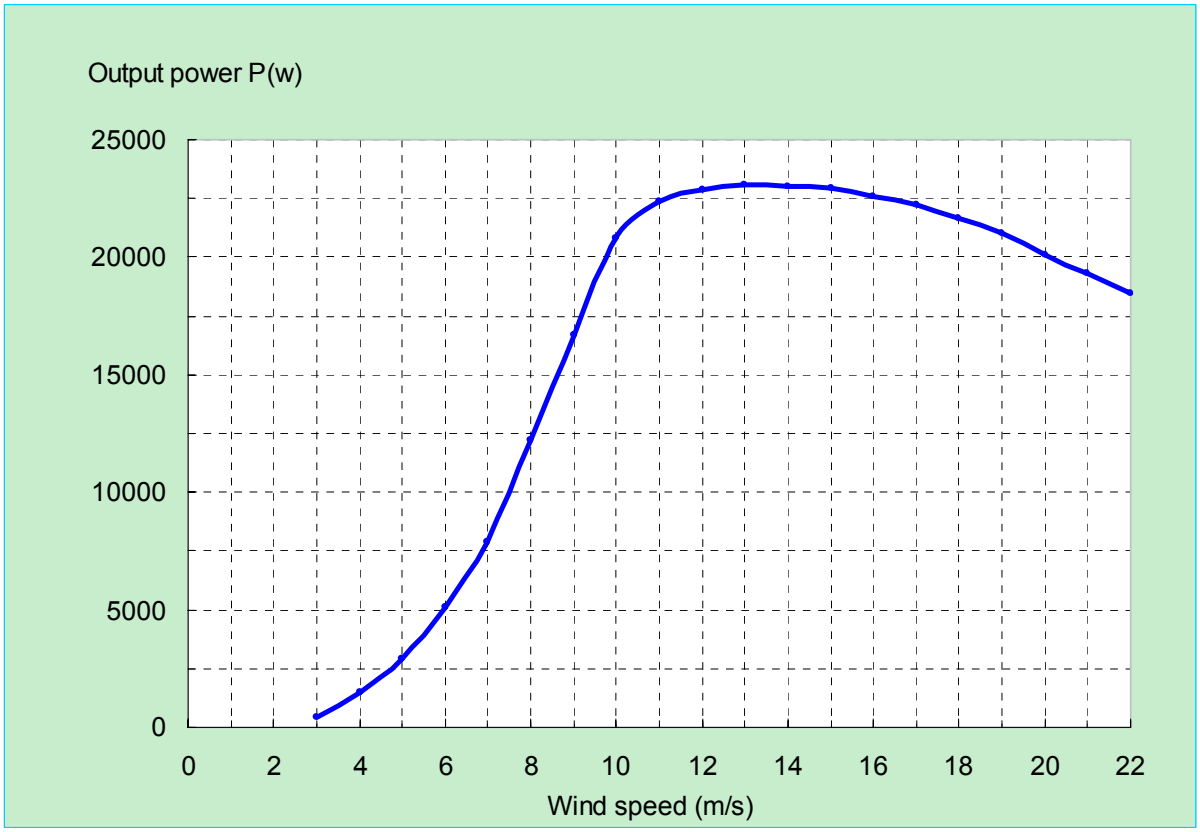
20kW Micro Wind Generator

Technical Specification:

No.	Item	Data
1	Rated power(W)	20000
2	Maximum output power（W）	30000
3	Charging voltage (V)	DC 300V
4	Blade quantity	3
5	Blade material	GRP
6	Blade diameter（m）	Ø9.0
7	Start-up wind speed (m/s)	3
8	Rated wind speed (m/s)	10

No.	Item	Data
9	Rated rotating rate (r/min)	120
10	Wind energy utilizing ratio (Cp)	0.42
11	Generator output	Three-phase frequency conversion AC
12	Output AC frequency (Hz)	0~360
13	Rated charging current (A)	65
14	The maximum charging current (in a short time)(A)	110
15	Generator efficiency	>0.8
16	Wireless tower diameter(mm)	Ø 800×Ø 510×18000 (3pcs)
17	**Tower height(m)**	**18m**
18	**Generator weight (kg)**	**310kg**
19	Battery 12V 150Ah/200Ah	25pcs

Output curve- KF-9.0-20000 Wind Turbine



Part II Superiority

Feature	Breeze type wind turbine	Conventional products
Alternator	350W weights 5kg 1 KW weights15kg 2KW weights 25kg	300W weights 25kg
Start wind speed	2.0-2.5m/s	3m/s above
Rated wind speed	6m/s	12m/s above
Alternation Efficiency	80%	52%
Wind Utilize Ratio	50%	25%
Inverter	Full sine-wave inverter	Modified sine-wave inverter
Inverter can bear	Equipment with motor available Equal rated power load available	Only pure resistant load Can bear 0.4~0.6 rated power load
Multi-function integrated	Controller, inverter & dump-loader integrated	Controller & inverter separated

Part III Main Parts of the Micro WTG

Main Parts	Function & feature	Material
Generator	In the Nose cone 4core patents, in which 2 globe very light, efficiency above 0.78	High magnetic Special cooper alloy Hard stainless steel Aviation aluminum alloy
Nose cone	In front of the blades top reduce the wind effect to the turbine body; the generator is set in it for heat releasing.	Hard aluminum alloy Airproof: Water proof, anti-corrosion, ultraviolet proof, sand prevent and anti-salt/fog function integrated
Blade	Three, accept wind energy and converse wind energy into mechanical energy,（Tree blades a pair to be changed together）	Reinforced fiber glass material
Yaw Shaft	To link the tower, tower cover, combined the blade, generator, tail pole, tail wing and tower together.	Aluminum Alloy Weight 2kg, which is 1/10 of the conventional Yaw Shaft and its volume is1/5 of conventional ones.
Tail pole	To keep the wind turbine facing the wind;	Manganese steel
Tail wing		Stainless steel
Anchor	To fix the tower under ground	Steel
Tower	Guy tower Free stand tower Hydraulic tower Lattice tower	Carbon steel, salt and acid proof, as well as UV-proof

Part IV Wind Turbine Generator Parts View

5kW Nose Cone

3kW Yaw Shaft

3kW/5kW Dump-load inverter& controller integrated system For Grid-off (stand alone) system

The back View

Dump-load inverter & controller system for Grid on (grid tied) system

5kW Wind Turbine Generator

Part V Residential

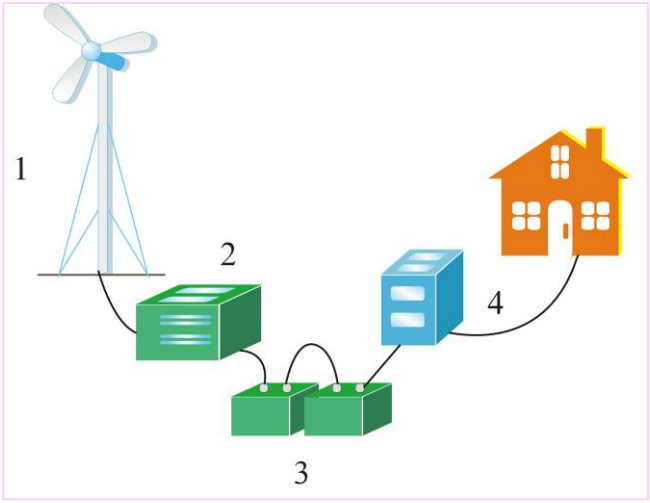
Off-Grid Wind Turbine System:

1) Wind turbine on a tower

2) Wind turbine charge controlling system

3) Battery bank to store a reserve of energy to be used by the home

4) Inverter to convert battery electric to household power.



Grid-tie Wind Turbine System with Battery Backup for Home:

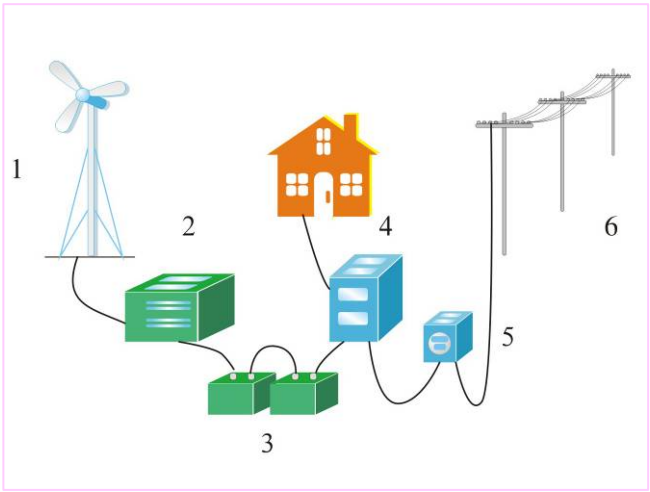
1) Wind turbine on a tower

2) Wind turbine controller

3) Battery bank

4) Grid-tie inverter

5) Utility meter to track how much energy is fed into the electric grid (6.)



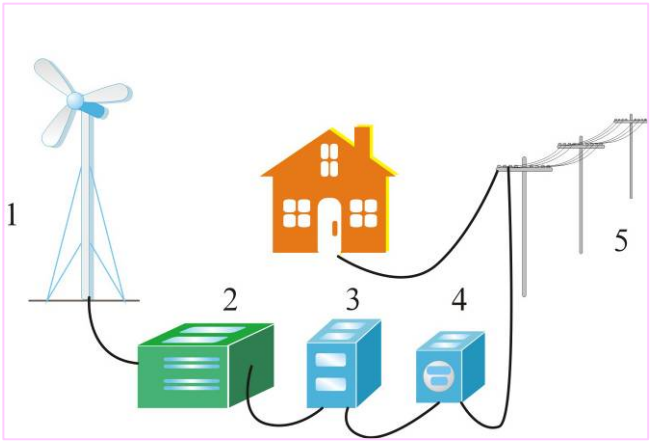
Grid-tie Wind Turbine System (no battery backup):

1) Wind turbine on tower

2) Wind turbine controller

3) Grid-tie inverter

4) Utility meter to track how much energy is fed into the electric grid (5.).

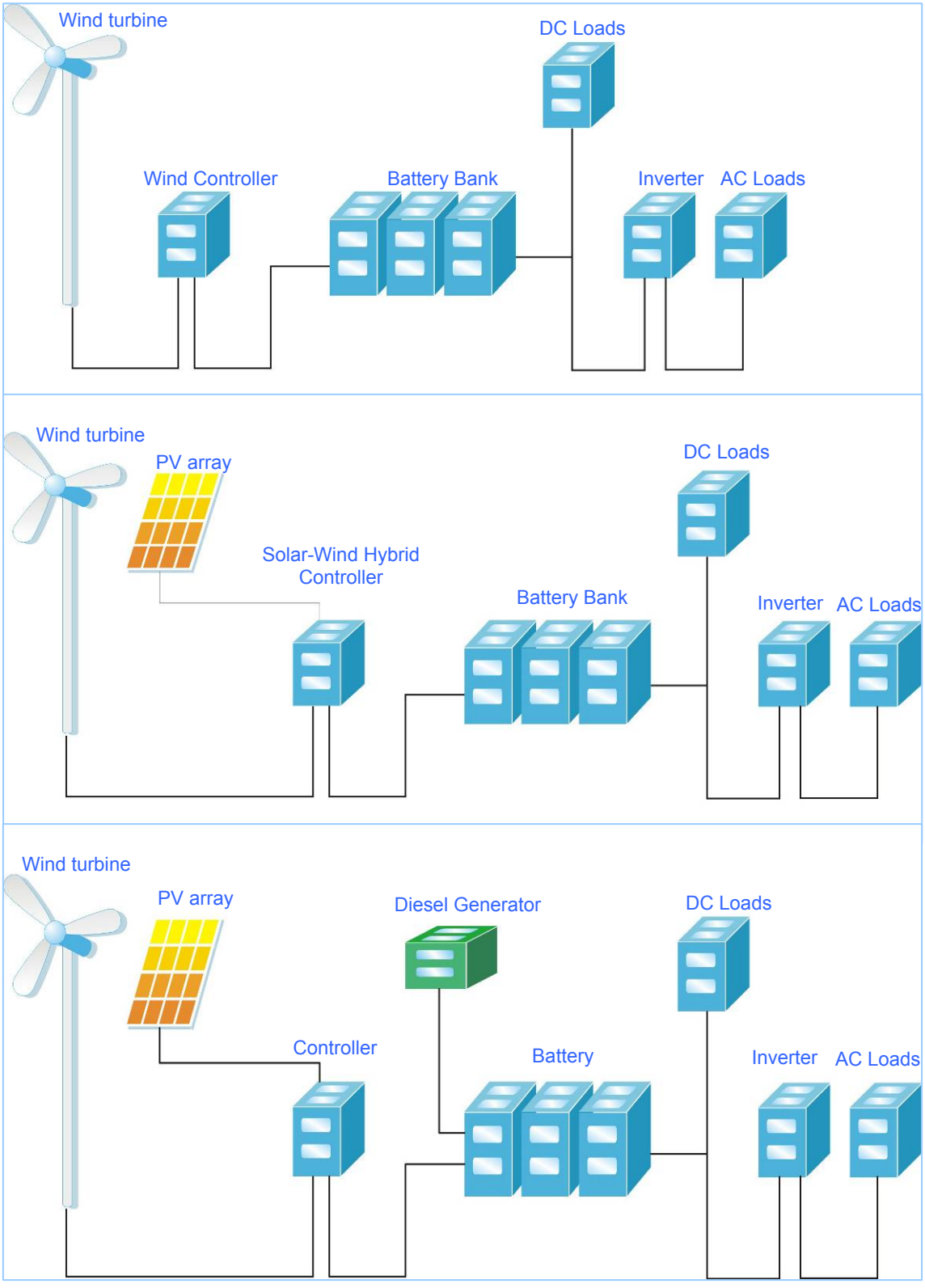


Note:

1 The drawings are typical solution of wind turbine system.

2 The breeze type wind turbine equip with a controller, inverter and dump-loader integrated set.

Part VI Hybrid System



How to Install a Wind Turbine

1. Before the wind turbine is erected, tower, nacelle, and rotor are transported to the site on large trucks. If it is a very tall wind turbine the parts may be so big that you have to transport them at night in order not to disturb.
2. The rotor is assembled at the site. The large crane can lift heavy things 50 meters up in the sky. This tower is 45 meters tall and will be assembled from two sections. You want to make sure that the sections are secured properly. That is why they are bolted together.
3. The crane can work with great accuracy. To make the two sections of the tower fit precisely, the crane driver often has to move the crane only one or two millimeters! If it is too windy it is difficult to steer the sections into place.
4. When the nacelle is being placed on the tower, the man has to hold it with a rope. In that way, he can steer the nacelle to exactly the right spot on the tower. The man has a radio-link to some men inside the tower.

5. The rotor can be difficult to control. That is why the two men each have to hold a blade with a rope. At this point, it is extremely important that it is not too windy. What do you think would happen to the two men if the wind could catch the rotor and toss it.
6. The rotor is put onto the nacelle. This can be a little tricky if the rotor is not placed accurately in front of the nacelle. The two men on the ground help to steer it into the right position.
7. Now the wind turbine is almost complete - you would think. However, it has to be connected to the electrical grid, so the electricity can reach the consumers. The wind turbine also has to be checked to make sure everything is in order. But once that is settled, the wind turbine can generate electricity for 20-25 years.

Working Principle of a Wind Turbine

Modern wind turbines work on aerodynamic lift principle, just like the wings of an aeroplane. The wind does not "push" the turbine blades, but instead when the wind flows across and past a turbine blade, the difference in the pressure on either sides of the blade produces a lifting force, causing the rotor to rotate and cut across the wind.

Not all the power in the wind can be extracted by the turbine rotor. Theoretically, the maximum amount of power that can be extracted by a wind turbine, according to the Betz Law, is 59.6% of the power in the wind. Most wind turbines can extract about 40% or less of the power in the wind.

A wind turbine mainly comprises of three major parts - a rotor, a nacelle, and a tower. The horizontal axis, three-blade turbine on a free-standing tubular tower is the predominant configuration for large grid-connected wind turbines.

The rotor blades are made of composite materials. Unlike small wind turbines, the rotors of large wind turbines rotate rather slowly. Simpler wind turbines are fixed speed machines, often with two speeds - a lower speed for weaker wind conditions and a higher speed for stronger wind conditions. For fixed speed machines, the induction generator directly produces alternating current at grid frequency.

Sensors mounted on the nacelle detect the wind direction, and a yawing mechanism automatically orientates the nacelle and rotor to face the wind.

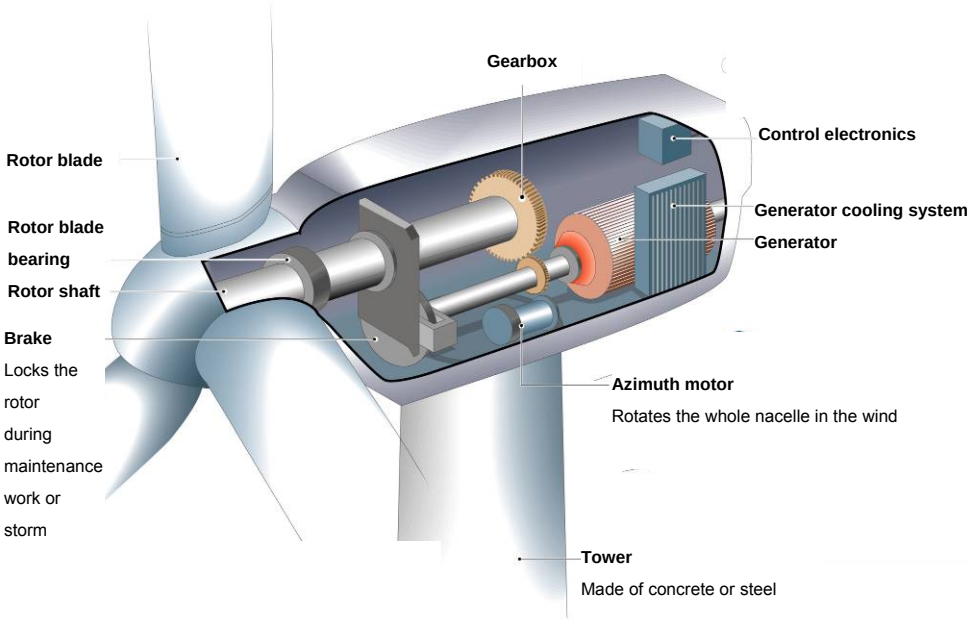
The rotational motion of the rotor is transmitted via a gearbox to the electric generator inside the nacelle (or in the case of gearless machine, is transmitted directly to the electric generator). Wind turbines with gearboxes are the common type in the industry. However, the use of purpose-built multi-pole direct-drive generators is also gaining notable development.

A transformer at the base of the tower (or for some designs inside the nacelle) steps up the generator voltage

to the grid voltage (11kV in the case of Hong Kong).

All turbines produce a varying power output dependent on the wind speed. The two most common means of limiting the power output (and hence the stress on the rotor) in high winds are 'stall regulation' and 'pitch regulation'. With stall regulation, an increase in wind speed beyond the rated wind speed causes progressive stalling of the air flow over the rotor. Tip brakes are used to brake the wind turbine when the wind gets excessively strong. In the case of pitch-regulated machines, each turbine blade can rotate about its own length-wise axis. The 'pitch angle' of the turbine blade varies with the wind speed, altering the aerodynamic performance of the rotor. When the wind gets too strong, the leading edge of the blade actually faces the wind so that the wind turbine brakes.

Lightning protection stripes are embedded inside the turbine blade, to bring the lightning charges to ground when a lightning stroke hits the blade.



Contact information

Jessica Liu

Renewable energy department

Kee Hing Cheung Kee Co., Ltd.

Tel : 0086-411-82532297

Fax: 0086-411-82532211

Website: http://www.khck.hk/New-Energy.htm

E-mail: jessica@khck.hk